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OHIO MOSSES, BRYALES*

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The present paper is a continuation of the study of the mosses of Ohio. The method of procedure and nomenclature used is the same as in the report on the Polytrichales.

BRYALES.

Hermaphroditic or unisexual mosses with archegonia situated at the tip of the main stalks and of ordinary branches. Gametophores usually erect, varying widely in vegetative characters. Scales from broad ovate to setaceous. Sporangium with a definite columella; peristome double, developed from the ampithecium and derived from the cell walls of a single layer of cells; outer teeth thin, transversely barred, the plates of the outer sides of the segments mostly in two rows separated by a median zig-zag line; the inner teeth membranous, sometimes lacking; sporangium rarely without a peristome.

SYNOPSIS OF THE ORDER.

- I. Teeth of the endostome, when present, alternating with those of the exostome.
 - A. Sporangium regular, erect..... ORTHOTRICHACEÆ
 - B. Sporangium elongated or pear-shaped, often with a neck-like hypophysis.
 - 1. Inner peristome with keeled segments, with inner cilia often present.
 - a. Sporangium only slightly or not at all zygomorphic, often pendent; hypophysis short or forming a long neck; inner peristome mostly with well-developed cilia..... BRYACEÆ
 - b. Sporangium decidedly zygomorphic, arcuate, long-necked; inner peristome without intermediate cilia..... MEESIACEÆ
 - 2. Inner peristome with basal membrane bearing cilia only, in twos or fours..... TIMMIACEÆ
 - C. Sporangium more or less globose, without a neck-like hypophysis; inner peristome without cilia or with cilia little developed... BARTRAMIACEÆ
- II. Teeth of the endostome, when present, opposite those of the exostome, either free or united with those of the outer set.
 - A. Endostome processes, when present, free..... FUNARIACEÆ
 - B. Endostome processes coherent with the exostome or absent.
 - 1. Minute cleistocarpous mosses..... EPHEMERACEÆ
 - 2. Sporangium minute, without a peristome; scales 2-ranked, confluent below, without a mid-rib..... SCHISTOSTEGACEÆ
 - 3. Sporangium with a very much enlarged hypophysis; scales more than 2-ranked..... SPLACHNACEÆ

* Papers from the Department of Botany, The Ohio State University, No. 174.

KEY TO THE FAMILIES OF BRYALES.

1. Scales 2-ranked, vertically placed forming a continuous margin on the gametophore.....SCHISTOSTEGACEÆ
1. Scales 2 to 8-ranked, not vertically placed..... 2
2. Plants dark except at the tip of the growing gametophores; on rocks and trees.....ORTHOTRICHACEÆ
2. Plants light green, or if blackish, then growing on the ground..... 3
3. Plants minute, almost microscopic, one-eighth mm. or less; on soil sporangium immersed.....EPHEMERACEÆ
3. Plants larger, 8 mm. or more; on soil, rocks, or trees; sporangium on a seta... 4
4. Cells on scales papillose..... 5
4. Cells of scales not papillose..... 7
5. Scales crisped when dry, strongly serrate.....TIMMIACEÆ
5. Scales not crisped when dry..... 6
6. Scales obtuse, broadly ovate to oblong-ovate, serrate or entire. MEESIACEÆ
6. Scales acute to acuminate, serrate.....BARTRAMIACEÆ
7. Swollen or expanded hypophysis.....SPLACHNACEÆ
7. Hypophysis tapering..... 8
8. Sporangium nearly actinomorphic, segments of inner peristome alternating with the teeth of the outer peristome.....BRYACEÆ
8. Sporangium strongly zygomorphic, segments of the inner peristome opposite the teeth.....FUNARIACEÆ

ORTHOTRICHACEÆ.

Gametophytes forming tufts of erect to ascending, dichotomously branched gametophores; scales solid, decurrent, oblong to linear-lanceolate, of mainly one layer of more or less uniform cells; seta erect, often short with the sporangium partly immersed; sporangium actinomorphic, erect, peristome double or single, rarely none, when double the segments alternating with the teeth.

1. Creeping with erect or ascending branches; calyptra cucullate, not plicate, *Drummondia*
1. Mostly erect; calyptra campanulate, plicate..... 2
2. Scales ovate at the base, crisped when dry; sporangium exserted..... *Ulot*
2. Scales not ovate at the base, not crisped when dry; sporangium immersed or emergent..... *Orthotrichum*

1. DRUMMÓNDIA Hook.

Peristome of 16 teeth, distinct to the base, not distinctly twisted nor longitudinally striate; calyptra cucullate; on trees.

Drummondia prorepens Brid. (*Anodontium prorepens* Brid.; *Hypnum clavellatum* Dill.; *Gymnostomum prorepens* Hedw.; *Orthotrichum clavellatum* Hook.; *Drummondia clavellata* Hook.) Creeping, with many erect bulbous branches, radiculose below, dark green almost black, bright at the tips; scales broadly lanceolate, revolute, concave, erect to spreading, entire, costa strong; seta less than one-eighth inch long, reddish-brown, twisted when dry; sporangium short ovoid, almost globose, erect, mouth wide. Fruits in summer. Reported from Lake, Franklin, and Clark Counties.

2. ORTHÓTRICHUM Hedw.

Scales not crisped when dry, bases not oval; stomata immersed in the neck of the sporangium; calyptra less densely hairy than *Ulot*; otherwise very like it.

1. On rocks; peristome single, teeth erect or erect-spreading when dry..... 2
1. On trees; peristome double, teeth more or less reflexed when dry..... 5
2. Sporangium fully exserted; 16-striate.....*O. anomalum*
2. Sporangium immersed or half-emergent; 8 or 16-striate..... 3
3. Half-emergent; 16-striate.....*O. cupulatum*
3. Sporangium immersed when growing; 8-striate..... 4
4. Sporangium half-emergent when dry; ovate-cylindrical.....*O. strangulatum*
4. Sporangium immersed when dry, ovate-globose.....*O. lescurii*
5. Sporangium strongly contracted below the mouth, deeply 16-striate, striæ reddish-brown.....*O. braunii*
5. Sporangium not strongly constricted below the mouth, less deeply striate, lighter in color.....*O. ohioensis*

Orthotrichum anomalum Hedw. (*O. saxatile* Brid.) Brownish, one-half to one inch tall; scales lanceolate, not crisped when dry, reflexed; sporangium lightly exserted, 16-striate, alternate striæ short and indistinct, hypophysis long and tapering, calyptra with few hairs, peristome teeth cross-barred, not reflexed when dry. On rocks. Autoicous. Early summer. Ottawa County.

Orthotrichum strangulatum Schw. (*O. porteri* Aust.; *O. cupulatum porteri* Venturi). Densely cespitose, one-third to one-half inch tall, branched; scales dense, ovate to lanceolate, acute, entire or papillose, somewhat revolute, costa strong, ending slightly below the apex; sporangium immersed when growing, may be only slightly so when dry, erect, ovate to cylindric, urn-shaped, 8-striate, reddish-brown, stomata immersed, few; calyptra densely erect-hirsute, operculum with rounded apiculation, peristome single, teeth often split. On rocks. Summer. No specimens in the herbarium but Jennings reports it as being found in Ohio.

Orthotrichum cupulatum Hoffm. (*O. strangulatum* Beauv.) Small dense tufts, about one-half inch deep; scales lanceolate, entire, revolute, costa ending below the point; seta short, sporangium half immersed, wide-ovate, 16-striate, with alternate striæ shorter than the others, constricted below the reddish-brown mouth, hypophysis short, calyptra sparingly hairy, covering the whole sporangium. Autoicous. Summer. Clark and Franklin.

Orthotrichum lescurii Aust. (*O. cupulatum minus* Sull.) Rather densely cespitose, about three-eighth inch tall, branched; scales dense, lanceolate to ovate, acute, entire, revolute, costa ending slightly below the apex; sporangium practically immersed, urn-shaped, ovate-globose, 8-striate, sometimes constricted below the mouth, operculum mamillate. On granite rocks. Spring. No specimen in the herbarium but it is probably found in Ohio.

Orthotrichum braunii Sch. (*O. strangulatum* Sull.) Cespitose, creeping with erect-spreading branches, less than one-fourth inch tall, dark green with lighter tips; scales entire, acute, revolute, clasping, not crisped when dry, costate; sporangium partly immersed, sharply 8-striate, reddish-brown, deeper color on the ribs, constricted below the mouth when dry, peristome double, teeth recurved, hypophysis short. Morgan Co.

Orthotrichum ohioënsis Sull. (*O. canadense* Sull.) Similar to *O. braunii* except in the nature of the sporangium which is lighter in color, not so deeply constricted below the mouth, nor so deeply 8-striate, neither are the peristome teeth reflexed; the plants are lighter green and taller with ovate-oblong scales; calyptra hairy. Autoicous with the antheridial clusters axillary. Specimen from Franklin County, reported from Lake and Lawrence.

Orthotrichum ohioënsis citrinum (Aust.) Lesq. and Jas. (*O. citrinum* Aust.) Scales lighter green, sporangium light yellow, thin, not constricted. Reported from Lake County.

3. *ULOTA* Mohr.

Scales dark green to blackish, lighter at tips of the gametophores, spreading to squarose, concave, usually crisped when dry, costa percurrent or nearly so, strong. Sporangium erect, actinomorphic, striate when dry; stomata superficial on the hypophysis; calyptra mitrate, plicate, usually pubescent with erect hairs; peristome usually double, teeth with a median line on the longitudinal face.

1. On rocks; scales not crisped when dry..... *U. americana*
1. On trees; scales crisped when dry..... 2
2. Sporangium smooth, with striæ near the mouth; mouth distinctly narrowed,
U. ludwigii 3
2. Sporangium distinctly striate; mouth wide..... 3
3. Sporangium constricted below the mouth, hypophysis long and tapering,
U. crispa
3. Sporangium not constricted below the mouth, hypophysis abrupt,
U. crispa minus

Ulota americana (Beauv.) Limp. (*Ulota hutchinsiae* Schimp.; *Orthotrichum hutchinsoniae* Sm.; *Weissia americana* (Pallis) Lindb.) "American *Ulota*." Loosely cespitose; scales lanceolate, not bordered, revolute, carinate, strongly nerved, closely appressed, not crisped when dry; seta about one-fourth inch long; sporangium yellowish, cylindric, hypophysis tapering, irregularly 8-striate, with more or less distinct intermediate ridges when dry. Autoicous. Spring. Lake County.

Ulota ludwigii (Brid.) Brid. (*Orthotrichum ludwigii* Brid.; *Weissia coarctata* Lindb.) "Puckered *Ulota*." Loosely cespitose, creeping with erect branches, one-fourth to three-eighth inches tall, densely tomentose below; scales narrowly lanceolate, long, acute to acuminate, somewhat twisted when dry, dense, entire, revolute, concave at the base, erect-spreading, costa sub-percurrent; seta short, yellowish, twisted when dry; sporangium erect, short-pyriform, striæ short below the mouth, hypophysis long and tapering, peristome usually single. Autoicous. On trees in woods. Summer. No specimen.

Ulota crispa (L.) Brid. (*U. ulophylla* Broth.; *Orthotrichum crispum* Hedw.; *Bryum crispum* Gmel.; *Weissia ulophylla* Ehrh.) "Crisped *Ulota*." Densely cespitose, about one-half inch tall, gametophores erect and sparingly branched; scales dense, narrowly lanceolate, curled when dry, erect when moist, entire, acuminate, costa percurrent; seta short, sporangium scarcely emergent, erect, 8-striate, slightly constricted below the mouth, teeth reflexed when dry, hypophysis tapering. Autoicous. On trees. Summer. Not reported from Ohio but Jennings reports it as abundant in western Pennsylvania.

Ulota crispa minus Sche. (*U. crispa crispula* Hamm.; *U. crispula* Bruch.; *Weissia ulophylla crispula* (Bruch.) Hamm.) Similar to *U. crispa* in appearance, but with both the gametophores and the scales shortened; seta one-fourth to three-eighth inches long, sporangium erect, sub-globose, not constricted below the mouth, striæ indistinct, hypophysis shorter than in *U. crispa*. Late spring and early summer. No specimen but is reported from Lake County.

BRYACEÆ.

Gametophytes small; upper scales usually larger than the lower ones, not winged nor clasping, often bordered by long narrow cells, costa excurrent, upper scale surface smooth; seta long, sporangium more or less zygomorphic, bent, drooping, or pendulous; pear-shaped, ovoid to cylindrical; calyptra smooth, early deciduous; peristome double, outer teeth 16, segments of the inner peristome alternating with the teeth, segments and teeth about equal in length, inner with a distinct carinate membrane, teeth with a median longitudinal line on the outer face; sporangium smooth when dry; protonema not persistent.

- | | |
|---|-------------------|
| 1. Rhizome-like stalk, with erect branches with a conspicuous comal tuft of larger scales..... | <i>Rhodobryum</i> |
| 1. Not rhizome-like, but may be inclined or arched, radiculose below; not conspicuously tufted..... | 2 |
| 2. Fertile gametophores with more or less tufted scales, sterile shoots longer, arched, often producing rhizoids..... | <i>Mnium</i> |
| 2. Gametophores all similar, erect-ascending, radiculose below..... | 3 |
| 3. Scales ovate to ovate-lanceolate..... | 5 |
| 3. Scales linear-lanceolate to linear..... | 4 |
| 4. Scales linear from a broader base, setaceous..... | <i>Leptobryum</i> |
| 4. Scales linear-lanceolate..... | <i>Webera</i> |
| 5. Scales not bordered; stomata immersed..... | <i>Mniobryum</i> |
| 5. Scales bordered; stomata superficial..... | <i>Bryum</i> |

1. LEPTOBRYUM (Schimp.) Wils.

Cells of scales narrow, linear-rhomboidal; cilia not distinctly appendiculate, scales not bordered, not papillose; sporangium pendulous, pyriform, smooth or only slightly and irregularly wrinkled; costa long-excurrent. Annual.

Leptobryum pyriforme (L.) Wils. (*Webera pyriformis* Hedw.; *Byrum pyriformis* Hedw.; *Mnium pyriforme* L.) "Long-necked Bryum." Densely cespitose, soft, one-half to one inch tall, yellowish-green, brown and matted below; scales elongated, linear-setaceous, erect-spreading, in dense terminal tufts, margins denticulate above, costa excurrent; seta very slender, one-half to one inch long, light-brown; sporangium pendulous, pyriform, reddish-brown, shiny, hypophysis narrow, tapering, darker than the oval-globose sporangium, operculum hemispherical. Synoicous. Wet shaded rocks and soil. June and July. Reported from Lake and Clark, and is common in greenhouses in Franklin County.

2. WEBERA Hedw. (*Pohlia* Hedw.)

Scales linear-lanceolate above, broadly ovate to obovate below, green to yellowish-green, often glossy, scale-cells linear to rhomboidal,

more than twice as long as broad, costa ending some distance below the apex, margin entire or more or less toothed near the apex only; costa narrow, scales inserted in 2 or 3 rows.

1. Stalks and costa reddish, densely cespitose..... 2
1. Stalks not reddish, costa reddish near the base..... *W. lescuriana*
2. Moist soil in rocky places and clefts of rocks; upper scales long shining, red at the base..... *W. cruda*
2. Wet peaty soil and decaying wood; scales shorter, red only on the costa,..... *W. nutans*

Webera cruda (L.) Schw. (*Pohlia cruda* Lindb.; *Bryum crudum* Schreb.; *Mnium crudum* L.) Densely cespitose, one to three inch tall stalks reddish, simple; scales erect-spreading, slightly serrate near the apex, glaucous green and shining; sporangium horizontal, cylindrical or only slightly constricted below the mouth, hypophysis indistinct, short, light brown, teeth yellow, seta long. In moist soil and rocky places or in clefts in the rocks. Usually autoicous. Summer. Reported from Lake County by Jennings.

Webera nutans (Schreb.) Hedw. (*Pohlia nutans* Lindb.; *Bryum nutans* Schreb.) Densely cespitose, branching, one-half to 2 inches tall, green above, dense brown tomentum below; lower scales ovate, upper ones linear-lanceolate in dense terminal tufts, denticulate near the apex, stalks and costa near the base reddish; seta glossy, reddish-brown, one-half to 2 inches long; sporangium horizontal to sub-pendulous, ovoid, light brown, mouth wide, constricted below the mouth, operculum mamillate, convex, hypophysis long tapering. Autoicous. Early summer. Wet soil and wet decaying wood. Common.

Webera lescuriana (Sull.) Jaeg. (*Bryum pulchellum* Sull.; *Bryum lescuriana* Sull.) Loosely cespitose, pale, stems not red, simple, ascending; scales small and remote below, larger and more dense above, lanceolate, acuminate, serrulate, recurved, not decurrent, reddish; seta erect, one-third to one-half inch long, yellowish-brown, lustrous; sporangium horizontal to pendulous, yellowish-brown, pyriform, hypophysis short, darker, mouth wide, operculum conic-apiculate to mamillate, peristome teeth yellowish pellucid. On wet soil. Unisexual. May. Fairfield and Lake.

3. MNIOBRYUM (Schimp.) Limp.

Small plants with the upper scales linear-lanceolate, glaucous-green, cells of the scales more or less rhombic-hexagonal, more than twice as long as broad, never linear except in the margin; cilia not distinctly appendiculate; distinctly serrulate.

Mniobryum wahlenbergii (Web. & Mohr.) Jen. (*M. albicans* Limp.; *Bryum wahlenbergii* Schw; *Hypnum wahlenbergii* Web. & Mohr.; *Webera albicans* Schimp.) Loosely cespitose, large up to three inch tall, stalks slender, flexuous, reddish; scales distant, linear-lanceolate, slender and long-pointed; seta erect, slender, flexuous, sharply hooked at the summit; sporangium pendent, reddish-brown, pyriform; wide mouth, no annulus, hypophysis short and wide, stomata immersed. Unisexual. Spring and summer, fruiting rarely. Wet soil of banks and ditches. Athens, Hocking, Butler, Lawrence, Clark, Champaign.

4. BRYUM (Dill.) Schimp.

Smaller mosses, usually densely tufted, non-stoloniferous, densely woven radicles, branching; scales often bordered, costa usually excurrent; sporophytes single, seta long, sporangium usually pendulous, peristome of 16 long lanceolate teeth and 16 segments alternating with the teeth, inner peristome with a basal membrane cilia appendiculate.

1. Branches julaceous, silvery.....*B. argenteum*
1. Branches not julaceous; reddish or green, not silvery..... 2
2. Inner peristome imperfect, membrane often united with the teeth..... 3
2. Inner peristome perfect..... 5
3. Teeth marked longitudinally.....*B. cernuum*
3. Teeth not marked longitudinally..... 4
4. Sporangium actinomorphic or only slightly curved; mouth oblique, small; on wet soil.....*B. uliginosum*
4. Sporangium incurved, zygomorphic; mouth not oblique; dry heaths and walls.....*B. inclinatum*
5. Costa vanishing below the apex.....*B. capillare*
5. Costa percurrent to long-excurrent..... 6
6. Scales long-decurrent; costa short-excurrent..... 7
6. Scales short-decurrent or non-decurrent; costa long-excurrent..... 8
7. Gametophores unisexual.....*B. pseudotriquetrum*
7. Gametophores synoicous.....*B. bimum*
8. Scales short-decurrent.....*B. affine*
8. Scales non-decurrent..... 9
9. Scales distinctly bordered, borders yellowish.....*B. pallescens*
9. Cells at edge of scale narrowed but scarcely forming a border.....10
10. Gametophytes unisexual; operculum deciduous.....*B. caespiticum*
10. Gametophytes synoicous; operculum more persistent.....*B. intermedium*

Bryum cernuum Hornsch. (*B. pendulum* Schimp.; *Cynodontium cernuum* Hedw.) Stalks red, erect; scales ovate-lanceolate, tufted, acuminate, reddish at the base, twisted when dry, costa conspicuous, red near the base, excurrent; seta light brown, copperish, one to one and one-fourth inch long, sporangium pendulous, cylindrical, mouth wide, teeth long acuminate, yellowish below, clear near the tips, inner peristome adherent, segments often split, cilia rudimentary. Synoicous. Spring and early summer. Clark County. Lesquereux lists it from "Southern Ohio."

Bryum inclinatum (Sw.) Bland. (*Pohlia inclinata* Sw.) Deep green, tufted; scales clasping, acuminate, ovate-lanceolate, denticulate near the apex, red at the base, revolute, long hyaline, with yellowish borders; seta one to one and one-half inch long, sporangium pyriform or slightly curved, narrow at the mouth, brown, cilia none or rudimentary, hypophysis tapering. Summer. On walls and slaty rocks. Summit County.

Bryum uliginosum Br. and Sch. (*B. cernum* Lindb.; *Cladodium uliginosum* Brid.) Gametophyte similar to *B. inclinatum*; seta one and one-half to two inches long, reddish-brown, lustrous; sporangium horizontal to sub-pendulous, large, often one-quarter inch long, incurved, teeth pale yellow, cilia absent or rudimentary, hypophysis tapering. Autoicous. Late summer. No specimen.

Bryum bimum (Schreb.) Brid. (*Mnium bimum* Brid.) Loosely cespitose, lax, matted together, stalks red, branches sparse; scales long,

slender, lanceolate, decurrent, appressed, revolute, pale, serrulate, in outer portion, slightly twisted when dry, distinctly bordered, costa short-excurrent, purplish-red; seta one to two and one-half inches long, slender, castaneous; sporoangium pendulous, reddish-brown, slightly or not at all constricted below the mouth, frequently upcurved, annulus large, teeth slightly sub-hyaline, segments shorter than the teeth, cilia appendiculate, hypophysis tapering. Synoicous. On wet soil and decaying wood. Summer. Stark, Clark, Lorain, Summit, Hancock, Champaign.

Bryum pseudotriquetrum (Hedw.) Schw. (*B. ventricosum* Dick.; *Mnium pseudotriquetrum* Hedw.) Similar to *B. bimum* but is unisexual, and generally larger and stouter. Tip of antheridial branch large and discoid. Spring and early summer. Vinton, Clark, Fairfield, Champaign.

Bryum affine (Brid.) Lindb. (*B. cuspidatum* Schimp.; *Webera affinis* Bruch.) Gametophores one-quarter to two inches or more in height; scales densely tufted, slightly decurrent, acuminate, more or less serrulate near the apex, almost entire, revolute, slightly twisted when dry, ovate-lanceolate, reddish near the base, costa excurrent, reddish; seta one to one and one-half inches long, lustrous, castaneous; sporangium horizontal to pendulous, oblong-pyriform, constricted below the mouth when dry, hypophysis tapering, yellowish-brown, operculum convex, mamillate, peristome yellowish-pellucid below, sub-hyaline above, segments shorter than the teeth, cilia appendiculate. Synoicous. Summer. Damp walls and rocks. Not reported from Ohio, but is found in western Pennsylvania near our border.

Bryum intermedium (Ludw.) Brid. (*Mnium intermedium* Ludw.; *Webera intermedia* Schw.) Dark, bronze green, one-half to one inch tall, stalks reddish, scales tufted, long-acuminate, revolute, almost entire, concave, recurved, slightly decurrent, costa excurrent in a long awn; seta three-quarters to one inch long, copper colored and glistening; sporangium horizontal to almost pendulous, elliptic-pyriform, often in-curved, brown, redder near the mouth, teeth lighter, incurved when dry, hypophysis long tapering and often curved. Synoicous. July and August. Cliffs, walls and wet sand. Clark County.

Bryum pallescens (Schl.) Schw. (*B. turbinatum* Drum.) Yellowish-green, one-half to two inches deep; scales tufted, sparse below, ovate to ovate-lanceolate, acuminate, erect-spreading, reddish at the base, recurved slightly, twisted when dry, costa excurrent in a long point, toothed, reddish; seta about one inch long, erect, flexuous, lustrous, castaneous, sporangium inclined to sub-pendulous, oblong-pyriform, hypophysis tapering, cilia appendiculate, in threes, yellowish. Autoicous with antheridia on a separate branch. May or June. Rocks and crevices in walls. No specimen, but it is reported from Lake County.

Bryum caespitium (L.) Hedw. Gametophores one-half to one inch tall, very slender, light bright green; scales ovate to lanceolate, acuminate, entire, revolute, concave, dense near tip of the gametophore, small and distant below, costa long-excurrent, reddish; seta copper-colored, two-thirds to one-half inch long, flexuous; sporangium horizontal to pendulous, slightly or not at all constricted below the

mouth, cilia appendiculate, segments as long as the teeth, hypophysis tapering. Dioicous. Early summer. Delaware, Fairfield, Clark, Hardin.

Bryum argenteum (L.) Hedw. "Silvery Bryum." Gametophores small and compact, one-quarter to one inch or less; scales broad ending in a bristle, clasping, concave, compressed, light green, silvery when dry, entire, very pellucid, costa ending below the apex; seta one-third to one-half inch long, sharply curved at the top, sporangium pendulous, reddish-brown, slightly constricted below the mouth, cilia as long as the segments, operculum yellowish. Autumn. On dry earth, crevices in walks, etc. Lake, Franklin, Clark.

Bryum capillare (L.) Hedw. (*Mnium capillare* L.) Gametophores small, one-half inch or more in height; scales dense near the top of the gametophore; light green, lanceolate, revolute, entire, costa brown, excurrent; seta one-half to three-quarters inches long, slender, brown; sporangium horizontal to sub-pendulous, brown, slightly constricted below the mouth, peristome conspicuous, hypophysis long and tapering. Usually unisexual. Summer; fruit rarely found. Loam and leaf mold. Greene County.

5. RHODOBRYUM (Schimp.) Hampe.

Large stoloniferous mosses with clustered sporophytes.

Rhodobryum ontariense (Kind.) Paris. (*Bryum roseum* L. & J.; *Bryum ontariense* Kind.; *Bryum proliferum* (L.) Shibth.; *Mnium roseum* Weis.) "Giant Byrum." Large, yellowish-green, with sudden conspicuous terminal tufts of scales, long and creeping, branches one to two inches tall; scales large, almost one-half inch long, acute, sharply serrate, wavy when dry, costa percurrent; seta one and one-half to two inches long, brown; sporangium paler, slightly curved, horizontal, teeth bordered, hypophysis long and tapering. Unisexual. On rotting wood and humus. Specimens from Champaign, Fairfield and Clark and reported from Franklin by Professor Schaffner.

6. MNIMUM (L.) Hedw. (*Astrophyllum* Neck.)

Large plants, upper scales ovate, cells of the scales rhomboidal-hexagonal, nearly as broad as long, never linear; sporangium cylindric-oblong to ovoid, pendulous; cilia not appendiculate.

- | | |
|--|----------------------|
| 1. Scales not bordered..... | <i>M. stellare</i> |
| 1. Scales bordered..... | 2 |
| 2. Scales entire or nearly so..... | <i>M. punctatum</i> |
| 2. Scales distinctly serrate..... | 3 |
| 3. Scales serrate with a single row of teeth..... | 4 |
| 3. Scales serrate with a double row of teeth..... | 7 |
| 4. Scales serrate to the base or nearly so; sporophytes clustered..... | 5 |
| 4. Scales serrate in outer two-thirds or one-half only..... | 6 |
| 5. Scales usually acute; lid conic; unisexual..... | <i>M. affine</i> |
| 5. Scales usually obtuse; lid rostrate; synoicous..... | <i>M. rostratum</i> |
| 6. Scales not much crisped when dry; sporophytes clustered.... | <i>M. drummondii</i> |
| 6. Scales much crisped when dry; sporophytes single..... | <i>M. cuspidatum</i> |
| 7. Scales lanceolate; costa not reaching the apex; dorsally toothed.... | <i>M. hornum</i> |
| 7. Scales lance-ovate; costa percurrent in the upper scales; not dorsally toothed..... | 8 |
| 8. Peristome red; cells of the scales collenchymatous..... | <i>M. spinulosum</i> |
| 8. Peristome yellow; cells of the scales not collenchymatous..... | <i>M. serratum</i> |

Mnium hòrnum (L.) Hedw. (*Astrophyllum hornum* Lindb.) "Long-scaled Mnium." Cespitose, dark to bright green, one to two inches tall, unbranched, scales long-acuminate, curled when dry, costa distinct, ending below the apex, scales on the sterile shoots crowded, antheridial branch tip discoid; seta one-half to three-quarters inches long, reddish-brown, slender; sporangium yellow with a red mouth, sub-pendulous, ovate-elliptical, calyptra often clinging to the seta. Unisexual. On cliffs near streams or on sandy banks. Franklin County.

Mnium serràtum (Schrad.) Schw. (*M. marginatum* Beauv.; *Astrophyllum marginatum* Lindb.; *Bryum serratum* Schrad.) Loosely cespitose, one-half to one inch tall, dark, stalks reddish, densely tomentous below; scales distant, ovate to obovate, acute, costa reddish, percurrent in the upper scales, shorter below, serrate margins reddish, strongly decurrent; seta one-half to three-quarters inches long, pale, sporangium horizontal, ovoid, light yellow, hypophysis tapering, operculum rostrate. Synoicous. Early spring. Moist shaded banks or in crevices of rocks. Reported from Ohio by Lesquereux, but no specimens are in the herbarium.

Mnium spinulòsum Br. & Sch. "Red-mouthed Mnium." Less than one inch tall; scales obovate to spatulate, acute, decurrent, reddish bordered, costa usually percurrent, sporophytes single or clustered; erect; sporangium inclined to horizontal, ovate-oblong, light yellowish, annulus bright red, peristome red, operculum decidedly rastrate. On ground in evergreen woods. Reported from Lake County.

Mnium rostràtum (Schrad.) Schw. (*Astrophyllum rostratum* Lindb.; *Bryum rostratum* Schw.) Large, loosely cespitose, stoloniferous, branches erect, short; scales oblong to obovate, obtuse, costa shortly excurrent; sporophytes 1-3, sporangium horizontal to sub-pendulous, yellowish, peristome yellow, inner peristome orange, operculum rostrate. Synoicous. Spring. Earth or rocks in moist shady places, wet by spray. Specimen from Fairfield. Reported from Champaign.

Mnium cuspidàtum (L.) Hedw. (*M. sylvaticum* Lindb.; *Astrophyllum sylvaticum* Lindb.) "Woodsy Mnium." Cespitose, prostrate to suberect, about one inch tall, light green, brown radiculos below; scales distant, oblong-ovate or somewhat ovate, acute, decurrent, keeled, wavy when dry, serrate in the upper half, teeth usually of one cell, costa strong, vanishing below the apex; seta about one inch long, solitary, light brown, glistening; sporangium horizontal to sub-pendulous, light brown, peristome light, cilia as long as the teeth, hypophysis very short, deeper brown, calyptra pointed, splitting on the side. Synoicous. May. Cosmopolitan on rotten wood, stones and soil. Common.

Mnium drummondii Br. & Sch. Gametophytes one to one and one-half inches tall, loosely cespitose, with dense brown tomentum below; scales distant, large, one-eighth inches long, broadly ovate, mucronate, costa excurrent; seta one and one-half to two inches long, slender, flexuous, copper-colored, sharply curved; sporangium pendulous, light brown, ovoid, reddish at the mouth, segments of the inner peris-

tome as long as the teeth, hypophysis short. May-June. No specimen in the herbarium, but it is reported from Lake County by Claassen.

Mnium affine (Bland. Schw.) (*M. cuspidatum* Neck.; *Astrophyllum cuspidatum* Lindb.) Gametophytes large, one to three inches tall, pale green, darker when older, brown radiculose below; scales widely distant, ovate, acute, narrow at the base, decurrent, serrate to the base, border pellucid or often yellowish or reddish, teeth single; costa distinct, excurrent; tip of antheridial branch discoid, large; sporophytes usually clustered, seta reddish; sporangium pale yellow, pendent, ovoid-elliptical, cilia as long or longer than the teeth, hypophysis short. Unisexual. May. Rocks and wet soil. No specimen.

Mnium affine ciliare (Gren.) Muell. (*Astrophyllum ciliare* Lindb.) *Bryum ciliare* Grev.) "Toothed *Mnium*." Similar to *M. affine* with the exception that the sporophytes are single and never clustered, and the teeth on the scales are longer than in *M. affine*. Franklin, Champaign, Hardin.

Mnium affine rugicum Br. & Sch. (*Astrophyllum rugicum* Lindb.) Smaller, blackish with lighter green tips; scales oblong to orbicular, teeth almost obsolete, almost entire, very short; apex rounded; sporophytes single. Cool shaded ravines and swamps. Spring. Not reported but may be found.

Mnium stellare (Reich.) Hedw. (*Astrophyllum stellare* Lindb.) Densely cespitose, one-third to two inches tall, deep or bluish-green, soft, erect, branching at the base; scales slightly decurrent, apex rounded to obtuse-apiculate, dense, oblong-elliptic, slightly crisped when dry, non-bordered, teeth obtuse, rather distant in the outer half, costa ending well below the apex; tip of antheridial branch discoid; sporophyte solitary, sporangium inclined to horizontal, oblong, operculum conic-convex, peristome yellowish. Unisexual. Summer. Rarely found in fruit. Bases of trees in swampy woods. There is no specimen in the herbarium, although Beardslee reports this species as common and Miss Biddlecomb reports it from Clark County.

Mnium punctatum (L.) Hedw. (*Astrophyllum punctatum* (L.) Lindb.) "Early *Mnium*." Large, one to three inches tall, loosely cespitose, dark green, radiculose almost to the top; scales broad ovate, blunt, narrow at the base, scarcely decurrent, margin thick, costa strong, large up to one-quarter inch long; seta to one inch long, brown, sporangium sub-pendulous, light, becoming darker, operculum acutely rostrate, peristome yellowish, papillose. Unisexual. Early spring. This species is reported common by Beardslee, but there is no specimen in the herbarium.

MEESIACEÆ.

Gametophytes small to medium size; scales 3-8-ranked, with laminae of one layer of more or less uniform cells, not clasping, lanceolate to lance-ovate, recurved to spreading, squarose, obtuse or rounded, costa strong; seta usually very long and slender; sporangium arcuate with long tapering hypophysis, not constricted below the mouth; outer peristome of 16 teeth with a median line on the outer face, inner peris-

tome of 16 segments alternate with the teeth, keeled, cilia rudimentary, with a carinate basal membrane; calyptra cucullate. In bogs frequently with sphagnum.

1. Peristomes of equal length; surface cells of the scales papillose; sporangium striate when dry.....*Aulacomnium*
1. Inner peristome longer than the outer; surface cells of the scales not papillose; sporangium smooth or irregularly sulcate when dry.....*Meesia*

1. AULACOMNIUM Schw.

Scales strongly costate, cells collenchymatous; sporangium ovoid-cylindrical, somewhat zygomorphic, ribbed when dry, outer and inner peristome of equal length.

1. Scales ovate, strongly serrate; autoicous.....*A. heterostichum*
1. Scales lanceolate, serrate near the apex only; unisexual.....*A. palustre*

Aulacomnium heterostichum (Hedw.) Br. & Sch. (*Sphaerocephalus heterostichus* (Brid.) Britt.; *Arrhenopterum heterostichum* Hedw.; *Orthopyxis heterosticha* Beauv.) Loosely cespitose, much branched, yellowish-green, one to one and one-half inches tall, more or less prostrate, radicular below; scales ovate, lower ones obovate, rounded at the tip, costa yellowish-brown extending to just below the apex; seta reddish-brown, one-tenth to one-third inches long, sporangium reddish, curved, inclined, oblong-cylindric, 8-striate, hypophysis tapering, peristome light yellow, cilia slightly shorter than the teeth, operculum with a short blunt point. May and June. on rocks and sandy soil in the shade. Common throughout the state.

Aulacomnium palustre (L.) Schw. (*Mnium palustre* L.; *Sphaerocephalus palustris* (L.) Lindb.) "Ribbed Bog-Moss." Cespitose, branching, one to five inches tall yellowish-green with brown tomentum below, scales linear-lanceolate, to wider, acuminate, costa to just below the apex, serrate near the tip, crispate when dry, cells papillose; seta three-quarters to two inches long, yellowish-brown, twisted; sporangium arcuate, constricted below the mouth, reddish-brown, 8-striate, hypophysis long-tapering, a distinct line separating it from the body of the sporangium, peristome yellowish, operculum conic with a short blunt tip. Antheridial tip discoid. Reported from Lake County by W. C. Werner.

Aulacomnium palustre polycephalus Br. & Sch., which is reported from Champaign County by Werner, is described by Dixon as "a gemmiferous form" which produces pseudopodia from the axils of the scales and he thinks it a state rather than a true variety.

2. MËESIA Hedw.

Sporangium smooth, not ribbed when dry, segments two or three times as long as the teeth; costa thick.

1. Scale margins revolute, apex rounded.....*M. trichoides*
1. Scale margins plane, apex acute..... 2
2. Scales entire, 5 to 8-ranked.....*M. longiseta*
2. Scales serrate, 3-ranked.....*M. triquetra*

Meesia trichoides Spruce. (*Bryum trichoides* L.; *Meesia uliginosa* Hedw.) Dense pale green tufts; scales long and narrow, in 8 rows. Synoicous. No specimen.

Meesia triquetra (L.) Angstr. (*M. tristicha* Br. & Sch.) Loosely cespitose, dark green, radiculose below, sparingly branched; scales lanceolate, acute, decurrent and half-clasping, distant, keeled, squarose; sporangium pyriform, curved from a long erect collum, more or less twisted and wrinkled when dry, segments of the inner peristome about three times as long as the teeth, yellowish, operculum convex. In peat bogs. Reported from Southern Ohio, in H. C. Beardslee's catalog.

Meesia longisetia Hedw. Scales entire, decurrent, lanceolate, gradually spreading from an erect base, not squarose, crisped when dry. Synoicous. "Cranberry swamps in northern Ohio, not rare" according to Lesquereux and James.

BARTRAMIACEÆ.

Large deep tufts or cushions of branched gametophores, protonema persistent; scales papillose, not winged or clasping, laminae of mainly one layer of more or less uniform cells; sporangium sub-globose, ribbed when dry, drooping, inner peristome shorter than the outer with a distinct carinate basal membrane, outer peristome of 16 teeth with a median line on the outer face.

1. Cilia rudimentary or lacking; scales linear-lanceolate..... *Bartramia*
1. Cilia well-developed, except in *P. muhlenbergii*; scales ovate-lanceolate,
Philonotis

1. BARTRAMIA Hedw.

Scales little or not at all decurrent, cells papillose; sporangium striate, somewhat globose.

Bartramia pomiformis (L.) Hedw. (*Bryum pomiforme* L.) "Apple Moss." Cespitose, matted, soft, one-fourth to two inches tall, yellowish-green, dense, brown tomentum below; scales elongated, somewhat decurrent, spreading, concave at the base, margins revolute in the lower part, serrate near the tip, crowded, costa excurrent, distinct; seta reddish-brown, one-quarter to one-half inches long, sporangium light-brown, globose, 16-striate, zygomorphic, peristome reddish, segments shorter than the teeth, operculum short-umbonate. Cosmopolitan mosses found on rocks and moist soil in the shade. May and June. Common.

2. PHILONOTIS Brid.

Water-loving mosses with well-developed cilia; usually unisexual.

1. Scales not dimorphic, cilia rudimentary..... *P. muhlenbergii*
1. Scales dimorphic, cilia well-developed..... 2
2. Perigonial bracts obtuse, triangular, ovate, costa not reaching the apex,
P. fontana
2. Perigonial bracts long-acuminate with excurrent costa..... *P. calcarea*

Philonotis muhlenbergii (Schw.) Brid. (*P. marchia* Sull.; *Bartramia muhlenbergii* Schw.) Cespitose, yellowish-green, brown below, gametophores slender, stalks reddish, one-half to one and one-half inches tall, branches whorled; scales lanceolate to ovate, long-acuminate, distant, decurrent, falcate-second, ascending or appressed, somewhat crisped when dry, serrate in the outer portion, costa percurrent; seta copper-

colored, glistening, slender, flexuous; sporangium globose, zygomorphic, faintly striate, arcuate, cernuus, neck sunken when dry, brown, teeth reddish, operculum almost flat, umbo short. June. Wet rocks. Lake and Clark.

Philonotis calcàrea Schimp. (*Bartramia calcarea* Br. & Sch.) Densely cespitose, soft, bright green, somewhat glaucous above, branches in whorles, slender, erect, three to four inches tall; reddish-brown dense tomentum below; scales broadly ovate on the main stem, acuminate, concave, plicate, serrulate toward the apex, margin revolute, base slightly decurrent, erect-spreading to secund, costa strong, dorsally papillose; branch scales lanceolate, falcate-secund; sporangium similar to *P. fontana*. Summer; rarely in fruit. Calcareous bogs and swamps. Not reported but may be found.

Philonotis fontana (L.) Brid. (*Mnium fontanum* L.; *Bartramia fontana* Swartz.) Gametophyte tall, one to five inch stalks very slender, red, brown tomentum below; scales small, appressed, usually turned to one side when dry, ovate-lanceolate, acuminate, yellowish-green, costa often excurrent into a short point; seta red. One-half to one and one-half inches long; sporangium brownish, oblong, arcuate, striate, teeth reddish-brown; tips of antheridial branches red and discoid. Dripping rocks and swampy places. Lake, Licking, Fairfield.

TIMMIACEÆ.

Robust mosses, dull yellowish-green with brown tomentum below, scales spreading to recurved, base half-sheathing, non-decurrent, non-bordered, serrate, costa percurrent; sporangium cernuus to almost pendent, peristome double.

1. TIMMIA Hedw.

Protonema not persistent; upper scale surface papillose; sporangium smooth not ribbed when dry; inner peristome with a distinct basal membrane, cilia as long as the teeth.

Timmia cucullata Rich. (*T. megapolitana* Hedw.) Large moss resembling *Polytrichum*; scales narrow, long, coarsely serrate, in six series, spreading to recurved; seta straight at end of stalk; sporangium curved, ovoid to cylindrical, regularly furrowed when dry, hypophysis tapering, peristome double, teeth equidistant, inner peristome of cilia only in groups of fours, zygomorphic, strongly curved when dry, tapering gradually to the seta, calyptra remaining on the seta. May. Moist soil and bases of trees. Clark County.

FUNARIACEÆ.

Protomena sometimes persistent; upper scales concave forming a rosette, costa distinct, rarely excurrent; seta red and twisted, segments of the inner peristome opposite the teeth, keeled, no basal membrane, no cilia; mostly on moist earth or earth-covered rocks.

1. Protonema not persistent; scales without costa..... 2
1. Protonema persistent; scales without costa; calyptra splitting and remaining on the seta..... *Discelium*
2. Sporangium curved or mouth tilted to one side, peristome usually double; seta elongated..... *Funaria*
2. Sporangium actinomorphic, peristome none..... 3
3. Sporangium splitting equatorially, immersed and almost sessile, *Aphanorhegma*
3. Sporangium definitely operculate, with a long seta or immersed, *Physcomitrium*

1. APHANORHĒGMA Sull.

Earth mosses, light green, radiculose at the base, glabrous; cells elongated above the middle of the scales.

Aphanorhegma serratum (Hook & Wils.) Sull. (*Physcomitrium serratum* Muell.) Gregarious, erect, simple or forked, small; lower scales spreading, oblong-lanceolate, upper ones more erect, larger, spatulate-lanceolate, sparingly serrate above the middle, apex acute to acuminate, costa almost to the tip; seta short and stout; sporangium immersed, brown, annulus near the middle, calyptra mitreform; spores orange. Autumn. Wet clay soil. Reported from Ohio by Lesquereux.

2. PHYSCOMÍTRIUM (Brid.) Fuer.

Earth mosses, light green; cells elongated above the middle of the scales; sporangium exserted on a long seta, or if immersed then with 1-3 rows of denser cells below the line of dehiscence; sporangium operculate, erect, no peristome, calyptra mitrate.

1. Sporangium immersed, mouth wide, calyptra small..... *P. immersum*
1. Sporangium exserted, mouth narrow, calyptra larger..... *P. turbinatum*

Physcomitrium immersum Sull. (*Gymnostomum immersum* Sull.) Gregarious, one-eighth to one-quarter inch tall, antheridia in axils of the scales, branches bearing the archegonia coming from below; scales obovate to lanceolate, costa ending below the apex, serrate above the middle; sporangium immersed, globose, brown, erect, operculum apiculate, rostrate. Autumn. Clay banks where they are sometimes submerged. Reported from Lake County and from "river banks of southern Ohio" by Lesquereux and James.

Physcomitrium turbinatum (Rich.) Muell. (*P. pyriforme* E. G. Britt.; *Phascum strangulatum* Kind.; *Phascum hookeri* Macoun.) "Urn Moss." Gregarious, small, one-half inch or less, erect; scales slightly serrulate, oblong or oblanceolate, curled when dry; seta pale, slender to one-half inch long, sporangium erect, actinomorphic, globose to pyriform, turbinate and constricted below the mouth when empty, operculum flatly convex, rostrate, blunt, short. Autoicous. Late spring or early summer. On bare soil under trees and by roadsides, also on earth in greenhouses. Specimens from Franklin, Trumbull, Clark, Lawrence and Hamilton; reported from Lake.

2. FUNÀRIA (Schreb.) Hedw.

Protonema not persistent, scales not clasping or winged; sporangium operculate, wrinkled when dry; calyptra cucullate; inner peristome

usually distinct, lacking a basal membrane or cilia, outer peristome of 16 teeth with a median longitudinal line on the outer face. Autoicous.

1. Scales short-acuminate, costa mostly percurrent. *F. hygrometrica*
1. Scales long-acuminate, costa excurrent in some of the scales. 2
2. Sporangium striate and more or less plicate, annulus large. *F. flavicans*
2. Sporangium neither striate nor plicate, no annulus. *F. americana*

Funaria americana Lindb. (*F. muhlenbergii* Hedw.) Small, gregarious, loosely cespitose; scales erect-spreading, long-acuminate, oblong-ovate, entire, not revolute, costa excurrent; seta twisted when dry, sporangium erect, mouth to one side, curved when dry, smooth, hypophysis long and tapering, rugose when dry. May. On soil. No specimens. Reported from Ohio by both Jennings and Grout.

Funaria flavicans (Rich.) Michx. Atheridial gametophores erect; lower scales small, sparse, and ascending; upper ones tufted and spreading, lanceolate, long-acuminate, entire, costa excurrent; archegonial gametophores shorter, scales ovate, acute; seta reddish-yellow, glistening, one to one and one-half inches long; sporangium arcuate, reddish-brown, striate, hypophysis tapering, operculum almost flat, not apiculate, calyptra long-pointed. May or June. Moist clay soil. Specimens from Lucas and Lawrence.

Funaria hygrometrica (L.) Sibth. (*Mnium hygrometricum* L.) "Cord Moss." Gametophyte one-eighth to one-third inches erect, radiculose; scales wide ovate, acute, concave forming a bulbous tuft, light green, entire or nearly so, costa dark red, percurrent; seta copper-colored to dark red, slender, flexuous, twisted when dry, one to two inches long; sporangium strongly arcuate, mouth to one side; reddish, yellowish, or brown; striate, hypophysis tapering, operculum almost flat, not apiculate, annulus conspicuous, calyptra long-rostrate, peristome teeth united by their tips to a small disk. Autoicous. May or June. Common on soil especially on burnt-over ground. Throughout the state.

Funaria hygrometrica clavescens Br. & Sch. (*F. clavescens* Schw.) Similar to *F. hygrometrica* only more robust, being one to $2\frac{1}{2}$ times all dimensions. Dixon says that this is a luxuriant form of the preceding species developed under moist conditions. Reported from "Ohio" by Lesquereux.

4. DISCÉLIUM Brid.

Protonema persistent; gametophytes practically stemless, scales ecostate; calyptra splitting down one side and usually remaining attached to the seta; sporangium operculate. Unisexual.

Discelium incarnata Schw. (*D. nudum* (Dicks.) Brid.; *Bryum nudum* Dicks.; *Weisia incarnata* Schw.) Protonema brown; gregarious, gametophores almost microscopic, bud-like; scales entire, ovate; seta brown, one-half to one inch long, twisted when dry, sporangium zygomorphic, globose, inclined to horizontal. On clay or sandy banks. Lake and Delaware.

EPHEMERACEÆ.

Sporangium non-operculate; minute plants on soil; costa usually present, scales linear to obovate; sporangium immersed, sub-globose, cleistocarpous; protonema usually persistent.

1. Scales lanceolate; green protonema persistent.....*Ephemerum*
1. Scales ovate; protonema not persistent..... 2
2. Scales erect; stalk none; costa percurrent or excurrent.....*Acaulon*
2. Upper scales rosette-like and spreading, stalk long or short, costa ending below the apex.....*Physcomitrella*

1. EPHEMERUM Hampe.

Green protonema persistent; upper scales elongate lanceolate to linear; sporangium globose and apiculate; fruiting in autumn.

1. Scales ecostate, strongly serrate.....*E. serratum*
1. Scales costate..... 2
2. Costa ending at or below the apex.....*E. cohaerans*
2. Costa excurrent, scales gradually long-acuminate.....*E. crassinervum*

Ephemerum serratum (Schreb.) Hampe. (*Phascum serratum* Schreb.)

Minute, protonema green and abundant; scales lanceolate to linear, erect, margin coarsely serrate; sporangium globose, apiculate, submerged, brown, glistening. Unisexual. Autumn. Bare soil. Cuyahoga County.

Ephemerum cohaerans (Hedw.) Hampe. (*Phascum cohaerans* Hedw.)

Minute, densely gregarious; scales erect-spreading, oblong-lanceolate to ovate-lanceolate, slender, long-acuminate, strongly serrate. Reported by Jennings as occurring in Ohio.

Ephemerum crassinervum (Sch.) Muell. (*Phascum crassinervum*

Schw.) Minute, gregarious; scales linear-lanceolate, erect-spreading, long-acuminate, coarsely serrate above; seta short, sporangium immersed, globose, apiculate, half-covered by the calyptra. Unisexual. Late autumn and early spring. On wet and swampy soil in open fields. Reported by Jennings as occurring in central Ohio.

2. ACAULON Muell.

Green protonema not persistent; plants fruit mainly in the spring; scales broad-ovate, erose-denticulate at the tip, smooth, margins more or less revolute; sporangium not at all or only slightly apiculate, sub-globose, immersed; spores numerous.

1. Uppermost and perichaetial scales carinate, reflexed.....*A. triquetrum*
1. Uppermost and perichaetial scales concave, plane.....*A. rufescens*

Acaulon triquetrum (Spruce.) Muell. (*Sphaerangium triquetrum*

Schimp.; *Phascum triquetrum* Spruce.) Gregarious, minute, gametophores bulbous, pale green or yellowish; scales broadly ovate, deeply carinate, reflexed, irregularly denticulate above, costa excurrent, apiculate, recurved; seta arcuate; sporangium globose, smooth. Early spring. Sandy soil. Reported from Ohio by Jennings.

Acaulon rufescens Jaeg. (*Phascum rufescens* Kindb.) Minute,

bulbiform, yellowish-green; upper scales deeply concave, margins plane, irregularly denticulate at the apex, costa excurrent into a recurved

apiculus; seta and sporangium as in *A. triquetrum*. Moist clay and sandy soil. No specimen. Reported as common in the central states by Lesquereux and James.

3. PHYSCOMITRÉLLA Br. & Sch.

Protonema not persistent, fruiting mainly in the spring; scales spreading, rosette-like, dentate or serrate, not crisped when dry, smooth, margins plane or involute; sporangium globose to ovoid, non-apiculate, calyptra campanulate.

Physcomitrella patens (Hedw.) Br. & Sch. (*Phascum patens* Hedw.) Gregarious, pale green; scales lance-ovate to oblong or oval, short acuminate, serrate above, costa ending below the apex; seta short; sporangium globose, brownish, immersed or slightly emergent, usually splitting equatorially, obtusely apiculate; antheridia sessile in the upper axils. Paroicous. Autumn. Wet clay and sandy soil on banks or bottoms of streams. Lesquereux and James lists it as "not rare in Ohio."

SCHISTOSTEGACEÆ.

Plants small, about one-fourth inch tall, slender, sterile stalks with scales distichous, their bases confluent; fertile ones with a tuft of scales; scales ecostate; sporangium minute, erect.

1. SCHISTOSTEGA Mohr.

Gregarious annuals, propagating often by brood bodies on the protonema. Unisexual.

Schistostega pennata (Hedw.) Hook & Tay. (*S. osmundaceae* Mohr.; *Gymnostomum pennatum* Hedw. *Mnium osmundaceum* Dick.) "Luminous Moss." Protonema persistent and abundant, green and glistening; seta erect, very slender, sporangium globose, operculate, no stomata, peristome none. Spring. Fruits sparingly. Crevices and dark holes in rocks or the ground. Reported from Geauga County.

SPLACHNACEÆ.

Scales not papillose; hypophysis usually wider than the sporangium peristome single; growing on decaying animal matter.

1. SPLACHNUM (L.) Hedw.

Loose tufts, light to yellowish-green; scales obovate to broad-lanceolate; seta long, sporangium cylindrical to ovoid, 16 peristome teeth, usually reflexed when dry.

Splachnum ampullaceum (L.) Hedw. Stalks slender, one-half to one inch tall; scales distant, lanceolate, acuminate, coarsely serrate, red at the base when old, costa percurrent or nearly so; seta red, 1 to 2 inches long; hypophysis much wider than the sporangium, narrowing to the seta below, smooth, wrinkled when dry, purplish; sporangium brownish-yellow. Summer. Reported by Lesquereux and James as being found in the cranberry swamps of Ohio.